

Work Assignment SOW

Title: Planning and Management Support for a Systems Approach to Sustainable Innovation: Regional Applications

Contractor: IEc, Inc.

Contract No.: EP-W-10-002

Work Assignment Number: 4-63

Estimated Period of Performance: Sept 20, 2013 to _Sept 19, 2014

Estimated Level of Effort: __4172_ hours

Key EPA Personnel:

Work Assignment COR (WA COR):

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Background and Purpose:

The purpose of this work assignment is to promote the extension, enhancement, and implementation of an innovative, holistic approach to implement sustainable solutions in watersheds, communities, or tribal zones that are priority areas for EPA Regional Offices. The innovative approach involves adaptation and further refinement of “Triple Value” (3V) systems thinking and modeling, which EPA has successfully applied in Southern New England. EPA will require technical support for multifaceted activities throughout the implementation life cycle, including stakeholder engagement, system characterization, model development, sustainability assessment, innovative intervention, and outcome monitoring.

Nature of the Problems to be Addressed by the Work Assignment

In applying innovation to solve EPA's challenging problems, the EPA Regions have engaged in a variety of sustainability initiatives focused on specific watersheds, land areas, or communities. To support these efforts, the Office of Research and Development (ORD) has been developing an innovative, holistic approach to sustainable solutions based on the 3V model for systems thinking and simulation. Building upon the ongoing Narragansett pilot project in Region 1,

ORD is now in a position to assist Region 1 and other Regions in applying this 3V approach to support their sustainability initiatives in specific, high-priority problem areas. Examples of potential applications include innovative nutrient management solutions such as green infrastructure and aquaculture, land conservation and restoration to achieve coastal resilience, and integration of sustainability improvements across energy, water, and waste management. Certain applications may involve collaboration with non-EPA government programs, such as the U.S. Army's Net Zero initiative or local urban infrastructure projects. Incorporation of perspectives from multiple Regions and stakeholders in applying the 3V approach will strengthen the transferability of the approach and the resulting innovative sustainability solutions.

Scope of the Work Assignment

As EPA undertakes this innovative engagement to address the specific problems described above, demonstrating the application of systems thinking to sustainability, EPA staff will require contractual support under this Work Assignment from experts in various activities, such as, but not limited to, the following:

- identification of key sustainability indicators—ecological, economic, and social—that are relevant to regional stakeholder groups,
- modeling of inter-related impacts and feedback loops among current and potential options to address the nutrient problem,
- holistic assessment of expected benefits to the Region as a whole, and
- incorporation of systems understanding from diverse perspectives.

These experts may be the prime contractor, or approved sub-contractors.

The expected outcome of this effort shall be a cohesive strategy for achieving progress toward sustainable innovation, encompassing overall environmental improvements as well as future economic and social development. The project shall not only support effective policy and decision making within the collaborating EPA Regions, but can also serve as a model for other EPA Regions that are exploring similar challenges.

The 3V scheme for systems thinking expands upon the classic risk assessment and management paradigm and supports the realization of more sustainable solutions, including those based upon adaptive management. The System Characterization stage defines the scope and context of the system, identifies sustainability goals, and develops an integrated problem formulation. The subsequent stages of the process are Sustainability Assessment, involving analysis of alternative sustainable solutions, Sustainability Enhancement, involving implementation of the chosen intervention, and System Adaptation, involving progress monitoring and response to changing conditions and community goals. The process may require cyclical iterations to revisit prior decisions and to assure the resilience of both economic and ecological systems. Of course, stakeholder involvement throughout this process is a critical success factor.

The work assignment shall provide expert support focusing primarily upon the first two stages of the above process, in order to establish the necessary knowledge and tools to support implementation of the latter two stages by Regional personnel along with State and local partners. Information to be developed in the work assignment includes:

- Current baseline conditions for the selected sustainability issue, including potential adverse human or ecological impacts associated with resource scarcity or impaired environmental conditions.
- Ecological, geophysical, economic, demographic, and other characteristics that influence impacts in the study area, including spatial distribution, temporal trends, and unique local conditions that need to be considered.
- Important system characteristics, including point and non-point pollution sources, air and water quality, natural resource availability, industrial and agricultural practices, stormwater and waste management methods, economic development patterns, and relevant infrastructure systems.
- Identification of stakeholder groups with the aim of capturing diverse perspectives, including users, technical experts, and community leaders who may be early adopters and implementers of innovative strategies.
- Establishment of key stakeholder objectives and measurable indicators—environmental, economic, and social.
- Analysis of potential instruments for sustainable solutions, including regulatory actions, infrastructure improvements, voluntary programs, economic incentives, innovative technologies, and other possible interventions by governmental or non-governmental organizations.
- Potential hidden or unintended consequences of the above solutions, e.g., product life-cycle implications of regulatory restrictions or changes in industrial practices.
- Relative risks, costs and benefits of alternative strategies, including anticipated system resilience in the face of changing economic patterns, demographics, climate, and other factors, and the distribution of those risks, costs, and benefits among various stakeholder groups.

As the Sustainability Realization process moves from the System Characterization to the Sustainability Assessment and Enhancement stages, analytic tools can be used to model the interactions among socioeconomic drivers, environmental pressures, and sustainability outcomes. The 3V approach involves integration of the best available scientific knowledge and analytic tools within a coherent conceptual framework. Based on a modeling approach called “system dynamics”, EPA has developed a user-friendly decision support tool called 3VS (Triple Value Simulation) that enables users to test the future sustainability implications of various intervention scenarios.

Under this Work Assignment, the existing 3VS framework shall be adapted to other environmental issues identified by EPA Regions and their partners, and extended to perform broader analysis of sustainable solutions that support community, state, or Federal goals. The resulting 3VS applications shall provide a holistic, aggregated analysis of the expected environmental, economic, and social consequences of different alternatives. However, these models shall also be capable of incorporating the results of more detailed analyses, such as finite-element simulations of changing environmental conditions in local watersheds or geographic zones. Each model shall have a customized, interactive human interface that permits real-time

investigation of different alternatives and key assumptions. Thus, we anticipate that these models will be useful strategic tools for evaluating overall sustainable innovation opportunities.

Tasks and Deliverables:

The contractor shall not duplicate work performed under previous Work Assignments 1-28, 2-40, or 2-49, or 3-60. ICR rules shall be followed in all data acquisition and interactions with stakeholders.

Quality Assurance (QA) Requirements

Check [X] Yes or [] NO, if the following statement is true or false. The Contractor shall submit a written Quality Assurance Project Plan (QAPP) for any project that is developing environmental measurements or a Quality Assurance Supplement to the Quality Management Plan for any project which generates environmental data using models with their technical proposal.

Tasks and Deliverables:

The WA COR will review all deliverables in draft form and provide revisions and/or comments to the contractor. The contractor shall prepare the final deliverables incorporating the WA COR's comments.

Contractor personnel shall at all times identify themselves as Contractor employees and shall not present themselves as EPA employees. Furthermore, they shall not represent the views of the U.S. Government, EPA, or its employees. In addition, the Contractor shall not engage in inherently governmental activities, including but not limited to actual determination of EPA policy and preparation of documents on EPA letterhead.

The Contractor shall not duplicate any work performed previously.

TASK 1 - PREPARE WORKPLAN

The contractor shall prepare a workplan within 15 calendar days of receipt of a work assignment signed by the Contracting Officer. The workplan shall outline, describe and include the technical approach, resources, timeline and due dates for deliverables, a detailed cost estimate by task and a staffing plan. The WA COR, Contract Level COR and the CO will review the workplan. However, only the CO can approve/disapprove the workplan. The contractor shall prepare a revised workplan incorporating the Contracting Officer's comments, if required.

The workplan will address refinement of the Narragansett Bay Pilot, the Cape Cod Demonstration, and development of additional Regional cases in order to demonstrate Triple Value Simulation methodology and its use to enable systems thinking and sustainability innovation in Regional Applications..

Task 1 Deliverables:

1a. Workplan within 15 calendar days of receipt of work assignment, including Quality Assurance Plan under which the work will take place.

1b. Revised workplan within 3 calendar days of receipt of comments from the Contracting Officer, if required.

TASK 2 - UPDATE, OPERATION, AND USE CASES OF THE SYSTEM DYNAMICS MODEL (this work falls under Contract Statement of Work page 4 and 6, Section III, Element 1: Planning and management support, 1. Research)

Practical Objectives for the Systems Dynamics Modeling Project

The main focus of this effort shall be on the System Characterization and Sustainability Assessment stages, laying the groundwork for Sustainability Enhancement decision making and longer-term System Adaptation. The specific objectives and tasks undertaken in this effort shall be the following:

- **EPA will** – Identify potential Regional partners and problem scopes for 3VS application, including collaborations with other governmental agencies.
- **EPA will** - Identify initial lists of key issues, current conditions, concerned stakeholders, alternative interventions, potential sustainability indicators, and possible sources of information for each potential 3VS application.
- **The Contractor shall** – Establish contact with the designated Regional partners and collect relevant information from EPA and other stakeholders.
- **The Contractor shall** – Develop a detailed conceptual 3V model to represent the subsystems, resource flows, and issues of concern, and shall present the resulting System Characterization to the Regional partners and stakeholders.
- **EPA will** – Designate which of the Regional engagements shall continue into the Sustainability Assessment stage, requiring 3VS model development.
- **The Contractor shall** – Develop a 3VS system dynamics model for each designated application, using a standard commercial platform (e.g., VENSIM). The model shall support the approximate estimation of sustainability indicators at an aggregate level, and provide an interactive capability for evaluation of alternatives and strategic decision making.
- **The Contractor shall** – Customize the existing graphical user interface for each 3VS application, and investigate the availability/design of an improved interface using geographic visualization techniques.
- **The Contractor shall** – Apply the 3VS model to the EPA list of intervention strategies and various combinations of those strategies to support the assessment of the potential contributions of current and potential sustainability initiatives by EPA and other entities, thus revealing benefits, barriers, and potential synergies and/or conflicts among these initiatives.
- **The Contractor shall** – Identify important interdependencies and develop future

scenarios that take into account the relationships between environmental improvement, future economic growth, and societal expectations among Regional communities or tribes.

- **The Contractor shall** – Develop and articulate options for a cohesive, systemic strategy to achieve progress in sustainability, consistent with EPA’s established programs and policies.
- **The Contractor shall** – Building on the 3VS application experience, develop Use Cases and draft guidance to deliver to other EPA Regions or stakeholders that wish to apply systems thinking for development of sustainable solutions to similar environmental challenges.
- **EPA will** - Identify specific decision support frameworks (including software tools or logical processes) currently in use within EPA or other organizations for purposes of sustainability assessment and management.
- **The Contractor shall** – Develop an approach for linking the 3VS model with these decision support frameworks, and demonstrate the approach for at least one framework to be selected in consultation with EPA.

Specifically under this Work Assignment:

To support the Sustainability Realization process, ORD has developed a conceptual 3V model that depicts resource flows and causal linkages among industrial, societal, and environmental systems. For purposes of System Characterization in the context of a selected Regional problem, this model shall be customized into a more detailed, problem-specific form, showing the relevant ecosystem services, economic activities, waste streams, transport and fate mechanisms, and human or environmental consequences. This will support EPA’s selection of which applications should proceed to the next stage.

For each EPA-designated 3VS application, the contractor shall update or adapt the System Dynamics model developed for the Narragansett Bay watershed in order to address the identified problem scope. For purposes of analyzing sustainability policies and strategies, the model shall provide a holistic, aggregated analysis of the expected environmental, economic, and social consequences of different alternatives. However, the model shall also be capable of incorporating the results of more detailed analyses.

The contractor shall apply the model to support the assessment of current and potential sustainability initiatives, including the EPA list of intervention strategies and various combinations of those strategies. The contractor shall examine relevant geographic areas in order to perform a systematic assessment of current and potential initiatives for the stakeholders in the region.

The contractor shall integrate social and economic system components that are identified as high priorities for Regional or tribal communities in conjunction with stakeholder teams from ORD and EPA Regions. The contractor shall facilitate stakeholder meetings or gatherings in order to learn about stakeholder knowledge, values, and priorities.

The contractor shall participate in biweekly teleconferences (approximately 10) and face-to-face meetings at the Region 1 offices (approximately 3) and prepare meeting summaries to be distributed to the EPA project teams.

Task 2 Deliverables:

2a. Provide a system characterization for each potential Regional application within 3 months after selection of the location.

2b. Provide an updated operational prototype of the System Dynamics model for the each designated 3VS application within 6 months after initiation of the WA for testing by EPA.

2c. Provide advanced training sessions to EPA technical staff to allow the staff to improve skills in using “systems thinking” and in modification and development of Systems Dynamics models for different EPA issues and applications.

2d. Develop, in conjunction with ORD staff, System Dynamics Model Cases that demonstrate specific model applications at diverse scales and locations.

2e. Provide weekly reports of the results from the applications of the model in support of assessment of current and potential sustainability initiatives.

2f. Draft meeting summaries within 7 days after the end of the meeting due to the WA COR.

2g. Provide the final version of the summary within 7 days after receipt of EPA comments due to the WA COR.

TASK 3 - DRAFT AND FINAL PRODUCTS AND REPORT (this work falls under Contract Statement of Work page 6, Section III, Element 1: Planning and management support, 5. Reports)

The products of this Work Assignment shall be the initial conceptual models developed for each potential application; final versions of the System Dynamic models for each 3VS application; CDs containing detailed documentation and computer programs for the model(s) and data collected and used in the WA and detailed tables and figures describing the results of the different model applications; a guidance document (with tutorials) for EPA technical staff to use to apply systems thinking for sustainable solutions by use of this type of model; a final WA report with appendices providing technical details of the work; and development of use cases for systems thinking and transferability of the 3VS model(s).

The contractor shall provide a PowerPoint briefing on the initial conceptual 3V model developed for each potential Regional application, suitable for presentation at a stakeholder meeting.

The contractor shall organize two hands-on **demonstration** sessions for EPA technical staff at ORD locations to work with the 3VS models and to learn how to apply “systems thinking” and similar modeling approaches to EPA priority issues.

For each selected 3VS application, the contractor shall organize up to two stakeholder public meetings, including securing facilities, managing the logistics, taking notes, providing a draft report of the meeting **and reviewing specific details of these activities with the WA COR, if requested.** A Stakeholder Meeting is used to inform the Stakeholders about the work by EPA and its contractor pertaining to this work assignment. The Stakeholders are invited as individuals, not as speakers or as a committee, and shall not be traveling at EPA or contractor expense. The Stakeholders may participate in the open discussions, if they wish, and shall be encouraged to provide comments in writing to EPA as individuals. About 25 stakeholders will be expected to attend each of the meetings.

The contractor shall attend (remote or in person) stakeholder meetings organized by EPA specifically to inform transferability of this work to additional cases and shall document perspectives of stakeholders pertaining to systems modeling and priorities.

The contractor shall provide a draft final report for the each 3VS application describing the technical work performed and recommended options for intervention, with rationale. The contractor shall also provide (in report form) Use Cases and a description of other model applications and analysis that could be performed in the future and the potential benefit of doing this additional work. The training materials will be included as (a) Systems Thinking and Modeling and (b) Draft Guidance Document, with tutorials, for other EPA Regions and Offices to use to apply systems thinking for sustainable solutions by use of this model as the starting point.

Task 3 Deliverables:

3a. Provide an updated fully operational near-final 3VS model for each Regional application and presentation for stakeholders on dates to be determined by the Region; with final model within 10 days after receiving EPA comments meeting due to the WA COR.

3b. Draft Stakeholder Meeting reports within 5 calendar days after the end of workshop/meeting due to the WA COR.

3c. Update and finalize the Stakeholder Meeting reports from written comments from the stakeholders and EPA within 7 days of receiving them from EPA due to the WA COR.

3d. Provide a fully operational final Pilot model within 10 days after receiving EPA comments from the testing of the model due to the WA COR.

3e. Provide a compendium of training materials from Systems Thinking and Modeling trainings within 10 days following the training sessions.

3f. Provide a draft final report for each 3VS application by Aug.1, 2014 due to the WA COR..

3g. Provide a final report for the Narragansett Pilot incorporating EPA comments by Jan 1, 2014 due to the WA COR.

3h. Provide CDs containing detailed documentation and computer programs for the model(s) and data used in the WA and detailed tables and figures describing the results of the different model applications and Use Cases by Sept. 1, 2014 due to the WA COR.

SUMMARY OF DELIVERABLES AND DATES:

Task 1 Deliverables:

1a. Workplan within 15 calendar days of receipt of work assignment.

1b. Revised workplan within 3 calendar days of receipt of comments from the Contracting Officer, if required.

Task 2 Deliverables:

2a. Provide a customized system characterization for each potential Regional application within 3 months after selection of the location.

2b. After receiving comments from EPA WA COR, provide an updated operational prototype of the System Dynamics model for the each designated 3VS application within 6 months after initiation of the WA for testing by EPA.

2c. Provide advanced training sessions to EPA technical staff to allow the staff to improve skills in using “systems thinking” and in modification and development of Systems Dynamics models for different EPA issues and applications.

2d. Develop, in conjunction with ORD staff, System Dynamics Model Cases that demonstrate specific model applications at diverse scales and locations.

2e. Provide weekly reports of the results from the applications of the model in support of assessment of current and potential sustainability initiatives.

2f. Draft meeting summaries within 7 days after the end of the meeting due to the WA COR.

2g. Provide the final version of the summary within 7 days after receipt of EPA comments

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Task 3 Deliverables:

3a. Provide an updated fully operational near-final 3VS model for each Regional application and presentation for stakeholders on dates to be determined by the Region; with final model within 10 days after receiving EPA comments meeting due to the WA COR.

3b. Draft Stakeholder Meeting reports within 5 calendar days after the end of workshop/meeting due to the WA COR.

3c. Update and finalize the Stakeholder Meeting reports from written comments from the stakeholders and EPA within 7 days of receiving them from EPA due to the WA COR.

3d. Provide a fully operational final Pilot model within 10 days after receiving EPA comments from the testing of the model meeting due to the WA COR.

3e. Provide a compendium of training materials from Systems Thinking and Modeling trainings within 10 days following the training sessions.

3f. Provide a draft final report for each 3VS application by Aug. 1, 2014 due to the WA COR..

3g. Provide a final report for the Narragansett Pilot incorporating EPA comments by January 1, 2014 due to the WA COR.

3h. Provide CDs containing detailed documentation and computer programs for the model(s) and data used in the WA and detailed tables and figures describing the results of the different model applications and Use Cases by Sept. 1, 2014 due to the WA COR.



Marilyn ten Brink, Ph.D.

WA COR

Aug 19, 2013

(Revised, Sept 11, 2013. MtB)